NATIONAL ADVISORY COMMITTEE
ON MICROBIOLOGICAL CRITERIA FOR FOODS

99 JUN 16 P3:32

RISK ASSESSMENT ON THE PUBLIC HEALTH IMPACT
OF FOODBORNE LISTERIA MONOCYTOGENES

Thursday, May 27, 1999
8:10 a.m. to 4:10 p.m.

The Ambassador West Hotel
George I Conference Room
1300 North State Parkway
Chicago, Illinois

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I N D E X

LIST OF SPEAKERS

P R O C E E D I N G S

MR. MORRIS POTTER: Good morning. Welcome to the Listeria Risk Assessment Public Hearing. The Food and Drug Administration and Food Safety and Inspection Service, USDA, are conducting a risk assessment to determine the prevalence and extent of foodborne exposure to Listeria monocytogenes and the public health consequences of that exposure.

This is a call for information. The Risk Assessment Task Force will present the framework that they're developing. And we hope that the subcommittee and the full committee and the audience participants will be able to provide the necessary data input to make this a high-quality product.

The goal of these risk assessments -- yesterday's on Vibrio parahaemolyticus, and today's on Listeria -- is to provide FDA and FSIS with the information needed to review current policies and to ensure that future programs provide the maximum public health benefit.

I'd like to thank the Risk Assessment Task Force for preparing today's presentation. And I'd like to thank the Risk Assessment Subcommittee under Dr. Jahncke's care for their attention and counsel to the

Task Force. And I'd also like to thank the audience participants whose presence and participation underscores the importance of this public health effort.

With that, I'd like to turn the mike over to Dr. Jahncke, who will manage today's proceeding.

MR. MICHAEL JAHNCKE: Thank you, Dr. Potter. I would also like to thank the Risk Assessment group that has put together this document. Looking forward to the presentations. And we would like to welcome all of the subcommittee members and all of our guests in the audience.

Just a couple of procedural pieces. Please remember, when you do speak, to use the microphones -- we are being transcribed -- and to identify yourself and your association. Also, keep in mind that this is a discussion on risk assessment. Everyone should have a copy of the document, the presentations that will be based upon the document in our NAC folder. It should be under Tab 10, I believe. The title of it is, "Structure and Initial Data Survey for the Risk Assessment of the Public Health Impact of Foodborne Listeria Monocytogenes."

Everyone also ought to have a Draft Agenda. We will be following this Draft Agenda. The speakers will

make their presentation. There will be time after each of the presentations for questions. The way the questions will work is that we will take questions from the Risk Assessment Subcommittee members around the table. If there are no more questions from the Risk Assessment Subcommittee members, we will then take some questions from the National Advisory Committee people who are in the audience. And we will go through each of the presenters in that manner.

If you do look at the schedule, when all the speakers are finished in the morning, there will be a general committee discussion where we will invite up all of the speakers to the table and also any of the National Advisory Committee members in the audience to the table, for an open and general discussion. Following that, there will be an opportunity for open public comments.

I would like to start off this morning by each one of us around the table introducing ourselves and our affiliation. My name is Michael Jahncke, and I am with Virginia Tech.

MR. TERRY TROXELL: Terry Troxell, FDA.

MR. BRUCE TOMPKIN: Bruce Tompkin, Armour Swift-Eckrich.

MR. MICHAEL DOYLE: I'm Mike Doyle with the

University of Georgia.

MR. LEON RUSSELL: Leon Russell, Texas A & M.

MR. MICHAEL ROBACH: Mike Robach, Continental Grain.

MR. DAVID ACHESON: David Acheson, New England Medical Center, Tuft University.

MR. DANE BERNARD: Dane Bernard, National Food Processors Association.

MS. ANGELA RUPLE: Angela Ruple, National Marine Fisheries Service.

MR. ROBERT BUCHANAN: Bob Buchanan, FDA.

MS. MARGUERITE NEILL: Peggy Neill, Brown University School of Medicine.

MS. MARGARET HARDIN: Margaret Hardin, National Pork Producers Council.

MS. CATHY DONNELLY: Cathy Donnelly, University of Vermont.

MR. MICHAEL JAHNCKE: Thank you very much. With that, let us begin our session today. Our first two speakers are going to be -- Dr. Wesley Long, I believe, will be starting. And then Dr. Richard Whiting will also be part of the presentation.

The title of the presentation is Introduction to Listeria Monocytogenes, Risk Assessment. Dr. Long?

DR. WESLEY LONG: Good morning, everyone. Welcome to our day-long presentation on the structure and initial data survey for the risk assessment of the public health impact of foodborne Listeria monocytogenes.

Before we get into the technical presentations, I want to set the stage for the rest of the day that I hope will help both the Committee and the public help us to take this risk assessment on to the next stage and on to conclusion.

Before we get started, I just want to let you know that we did do a risk assessment activity yesterday all day and that we are starting anew today. So, those of you that were here yesterday, there will be some repetition. I can see that there are a number of different people in the audience, so I'm glad we decided to take this approach.

The stated purpose of the risk assessment is to determine the prevalence and extent of consumer exposure to foodborne Listeria monocytogenes and to assess the resulting public impact of such exposure. This risk assessment, how will the results of this risk assessment be used?

The risk assessment is intended to provide both FDA and FSIS with the scientific information that they

need to review their current programs relating to the regulation of Listeria monocytogenes contamination in foods and to ensure that those programs provide the maximum level of public health protection.

Now, if you've ever heard me speak before, you've ever asked me to speak, you're bound to see a slide very similar to this because I think it's very important that we point out a little bit that risk assessment is only one component of the risk analysis process, which includes risk communication, risk assessment, as well as risk management.

Risk managers have a number of factors that they need to consider when they make a decision. Public values are very important, and that's why this is a public forum and we are interested, of course, in what the public has to say today. There are senior-level risk managers here from both FSIS and FDA, and they'll be happy to listen to your comments and to consider those comments when we do get to the stage of evaluating the programs.

There will always be economic factors to consider. And while we do not base our public health decisions on economics, those are always considerations in terms of the cost benefit analysis of any sort of

actions.

There will always be political factors. I guess the point here is that even our risk managers have bosses. And factors such as budget and priority always have to be considered.

Technology, what we may be able to do may be limited by technology. And it may drive us in one direction as opposed to another. Statute. Both FSIS's are governed by laws that set the framework for what actions we can and cannot take.

Finally, there's the science. The science today is in terms of the risk assessment. The risk assessment is the organization of that science. So, the point here is just that the risk assessment is one of the considerations that will go into considering the revisions of our current programs in terms of the regulation of Listeria contamination in foods.

Now, the risk assessment is a collection of the scientific facts that are structured to try to clearly tell what it is that we know and what it is that we don't know. And they should be descriptive to characterize how well we know what we know. In addition, we want to put out extra efforts to be very transparent and to reveal any biases we may have. So, for example, if we decide

that we're going to use one data set as opposed to another, that needs to be very well-explained; and the effect on the end analysis needs to be clear for the risk managers and the public.

What questions do we hope that this risk assessment will answer? Can the relationship between the consumption of Listeria monocytogenes in foods and the risk of becoming ill be quantified? Can we establish a quantitative relationship between the numbers of Listeria that are consumed and the likelihood or the extent of illness? What data do we need that will help reduce the uncertainty in these estimates of risk that we're going to come up with? And does the assessment focus further efforts on specific foods or populations at risk? And I'll come back to this in a moment.

So, what questions will the risk assessment not answer? Again, coming back to risk management, we're not going to establish the appropriate level of public health protection today or through this risk assessment process, although the risk assessment will be considered in making those determinations. Right now, we're not gonna look at control measures that may be implemented for producers, manufacturers and consumers. And we're not gonna decide what levels of Listeria should be allowed in or on foods.

So, what are we hoping to get from NACMCF today? The purpose of my presentation is to help us all focus on risk assessment. Is their scientific approach sound? In the document, you see that we've laid out what we consider the parameters to be and the flow of the risk assessment. And we're very interested in whether you have recommendations on how we can revise that approach or modify that approach to enhance it and make it more useful.

Do we have all of the right data? I think the document that you have in front of you today was the result of casting a fairly wide net to try to capture all of the data and information that we could. There has been some initial data screening. The area that I am most familiar with is the dose-response component. And, for example, we decided to limit our data to post-1990 in terms of immunobiology and virulence characteristics because of advances in that science.

So, we are looking for your help in determining whether we have the right data. And I have a couple of comments about the data. We're looking for data. And this is gonna come up over and over during the day -- on the frequency of Listeria monocytogenes isolations from different foods; on the serotypes isolated from foods;

and, of course, on the levels of Listeria monocytogenes in various foods.

This data request is being structured in such a way that we're not intending to utilize any data that you might submit to us to take any sort of enforcement action against the submitter. And we are accepting data that is blinded to protect the confidentiality of those who might have data but might have various reasons for not feeling comfortable in submitting it. And, of course, have we overlooked anything?

Time line for the process: You know that we came to NACMCF in February and made an initial presentation of where we thought we were headed. And we're here today, of course, in May. There was a Federal Register document published a few weeks ago which has a comment period that closes July the 6th. And we're hoping for you to submit both your comments and any information and data you might have by that date.

Starting on that date, we will be, of course, between now and then revising our plans based on the comments that we hear today and wrapping up our data collection and beginning the modelling phase of this process.

We hope to have a draft report by September or

October of this year. We want to come back to NACMCF and to the public with the results of those analyses. And then we're going to initiate additional risk assessment activities starting, hopefully, in November of this year.

Those additional activities will be based on where this phase of this initial risk assessment leads us. And that might include analysis of product-specific pathways. What this risk assessment may help us do is target specific foods or classes of foods that we need to study more closely. We will also look at the effects of various interventions on pathogen load. And we may identify the focus of further research and technology development that will help us reduce the uncertainty to come up with better risk estimates of risk to help us better set policies.

I'm going to turn this over now to Dr. Whiting, and we'll get rolling on the day. Thank you.

DR. RICHARD WHITING: Wes just gave you a little bit of the outline of the risk assessment process and the structure. I want to just sort of begin an introduction of the risk assessment itself.

In the 1980's, I think you're all aware that we realized that Listeria monocytogenes was a foodborne pathogen. And when I mentioned the word, "Listeria," I

think for this meeting, we will be meaning Listeria monocytogenes pretty much through this whole presentation.

And at that time, there was a very intensive five- to six-year period of research in which we recognized the widespread occurrence of Listeria, both in the natural agricultural environment, as well as the food processing environment, and this widespread occurrence in foods.

There was also a couple papers where they found the presence of Listeria monocytogenes in the gastrointestinal tract of apparently healthy people. And we realize that despite this widespread occurrence of the organism, that the disease occurs relatively rarely. The figures are about .5 cases per 100,000 people. But when it does occur, it is very likely to be a serious disease. And it's a very opportunistic organism. It strikes the immunocompromised, including the elderly and pregnant women.

As a result of that, the Agencies, both FSIS and FDA, have had a zero tolerance policy for this organism in foods, which means if they find it in a sample, the food is considered adulterated. The industry put a very intensive effort in improving sanitation and

process controls. And from the period from about 1989-1990 into about the mid-1990's, we've seen a decrease of 40 to 50 percent in the incidents of Listeriosis.

However, in the last couple of years, we've seen a levelling off in this decrease in incidents. This may be that the preventative measures that have been taken have sort of run their course. It may also reflect more increased surveillance efforts and better detection of the disease. It's not really clear.

There's also been quite a bit of thinking in the scientific community on the dose-response relationship of just what consumption of low-dose of this organism means. And as a result of some of this thinking, several other countries that we are actively trading with -- I think of Canada and Denmark, in particular -- have regulatory policies in which if Listeria is found in certain classes of food, it is not automatically considered adulterated and pulled. So, these various considerations are some of those that are driving this re-looking at the Listeria question.

I also should mention that this is just part of our little broader effort by the Federal agencies to look at Listeria. FSIS has an ongoing survey. There is quite a bit of research on the organism. I particularly want

to mention the FDA graph per-dose response research. This is with the University of Georgia Primate Center where they are specifically doing challenge studies with pregnant monkeys to try to determine what the dose-response relationship is for this organism.

Also, within the CDC, I think, our food-net program, which you're aware of, has been very instrumental in getting better information on this organism. And the CDC is also in the final stages of planning a case-control study, which also should give us a lot more information on the incidences and various other information. And then, finally, the risk assessment.

I just want to say a little bit about that other risk assessment that you heard of yesterday, the follow-up on Wes' remarks. We have quite a different purpose here. The Vibrio risk assessment is focusing on one organism and primarily on one food. And you saw some pathway-type modelling where they were looking at increases and decreases in Vibrio. This risk assessment is more of a risk-ranking type, where we're looking at the very broad spectrum of foods and are interested in saying which foods contain how much Listeria. Both risk assessments, of course, then address the question of the

dose-response relationship.

So, with that, then I'd like to just say a little bit about the structure that you will have today. Two of the data-collecting areas in a risk assessment have been described as the exposure assessment and then the hazard assessment. And we follow that organization this morning. You will hear on the exposure assessment side. And we will have two presentations. Tony Hitchins will look at the survey for Listeria monocytogenes presence in food. And then Mary Bender will look at the consumption patterns in food.

The idea here is that the exposure of Listeria to the population is a result of how many Listeria organisms are in the food, then times the amount of the particular food that is consumed.

Next slide. Okay. This afternoon, then, we will move on to the other part, the hazard assessment. And there will be a presentation by Pat McCarthy looking at the epidemiological record. And I will admit, there is some overlap here. The epidemiological record, of course, gives us information on exposure, as well.

And then, secondly, a presentation by Richard Raybourne on the dose-response experimentation. This would be any animal, human feeding studies or in-vitro

experiments that would give us information on the dose and response.

After these two parts are done, we then move into the risk characterization phase, which you can call the modelling or the number-crunching, if you will. This will begin after this meeting. And just to complete our description of the team, Dr. Clark Carrington will head up the modelling section. But since we have not gotten to that point, there will be no presentation on that today.

So, thank you, Mr. Chairman. I turn the meeting back over to you.

MR. MICHAEL JAHNCKE: Yes. Are there any questions from the subcommittee members for either Dr. Long or Dr. Whiting?

If not, thank you very much for your presentation and excellent introduction to the subject.

We're now moving, as Dr. Whiting indicated, the next section is exposure assessment. And our presenter this time is Dr. Tony Hitchins. And his topic is presence of Listeria monocytogenes in foods.

Dr. Hitchins?

DR. TONY HITCHINS: Thank you very much. It's an honor to be here. If I could have the first slide.

Our work is done by the contamination work group of the FDA Center for Food Safety and Applied Nutrition.

Next slide, please. The members of the work group are as follows: Mary Lynn Datoc from FDA; Eric Ebel and Wayne Schlosser from the USDA; myself from FDA CFSAN; and Pauline Lerner from FDA CFSAN. Mary Lynn has been collecting data on vegetables and cheeses. Eric and Wayne have been collecting data on the meats. Pauline Lerner has been collecting data on the seafoods and is also now just moving into the milks. Myself, I've been collecting data on some of the larger studies that cover or contain all areas of foods, so all food types.

Next slide, please. Today, I'd like to overview Listeria monocytogenes in relation to food safety. I've been asked to do this as I am the first speaker up. And I hope the members of the audience, of whom there are a lot who are experts on monocytogenes, will bear with me at my simplistic approach. Then we'll move on to the actual meat of the talk, which is the food contamination data collection and then give an interim report on the results so far and perhaps indicate at the end some future work.

Next slide, please. Our role in the process or this module's role is to collect data on food

contamination by Listeria monocytogenes. We want to get a data base or are getting a data base. And we'll collate the items into various food categories. And these have to be harmonic with the Food Consumption Work Group's data base categories. They have a much more finely-resolved data base than we do. They have things like fish and fish with chips and so on, finely-resolved meals and foods -- whereas, we in the contamination area tend to have more grossly-resolved components such as even seafood, whatever that means. It means everything. So, we have to work that problem out.

Then we're going to determine the foodborne exposure to viable strains of the pathogen in the U.S.A. And this will then be used by the other people to relate exposure to risk of human foodborne Listeriosis in the U.S.A.

Next slide, please. Briefly looking at the Listeria, then, there are six species recognized today. Monocytogenes is the one of most interest. It is a human and animal pathogen. Then we have innocua and seeligeri which are not pathogenic. Welshimeri, ivanovii, and grayi. Ivanovii is another pathogen but doesn't appear to affect humans.

These are sort of grouped roughly into two

groups that reflect their occurrence in foods. When one gets Listeria contamination of foods, these are the ones most often involved, I think it's fair to say. Whereas, although these can occur in foods, they occur less frequently.

Next slide, please. The six species are typed once one has a Listeria isolate by various simple tests. And I'm not going to go into that today. We don't need to. But I will just mention that one of the tests that is used is the test for hemolytic activity by the species. And we see that the two pathogens are hemolytic. And seeligeri is also hemolytic, though it's not really considered to be a pathogen.

I mentioned the hemolysis because you're going to be hearing more about it, I think, this afternoon. So, I thought I would introduce that.

Next slide, please. In regard to food safety, some important properties of Listeria and Listeria monocytogenes are that it -- and the most important one is in terms of its control -- is that it grows very slowly at refrigeration temperatures. It can also grow without air. It's quite good at surviving freezing.

Next slide, please. And it's relatively resistant to many of the preservation agents, whether

chemical or physical. Looking at one of the physical agents, we can get a 90 percent heat kill in about .2 minutes at 150 Fahrenheit or 65 Centigrade, which is sort of a pasteurization-type temperature. It's relatively heat-resistant. Of course, that figure depends on what matrix one is looking at of food.

Some of the other organisms which are more heat-resistant are recognized as the most heat-resistant, vegetative forms of bacteria are the salmonella senftenberg and coxiella burnetti and mycobacterium tuberculosis.

Another important property is that it's slightly more resistant than most bugs, leaving out staphaureus, to low-moisture levels. It can grow at about 10 percent salt, which is equivalent to about 92 percent equilibrium relative humidity or a water activity of .92. So, all these factors make it, are of great importance in considering food safety.

Next. We've heard a little bit already about the serotypes. Monocytogenes and other Listeria species can be sub-classified into various serotypes that depend on the chemical composition of their outer layers, the flagella and cell wall components. And there are essentially seven types. Five and six are missing, but

they are covered by other species or occur in other species. Groups 1 and 2 are classified together, so sometimes we'll say, "1, 2a" or if we are a bit more slangy, we'll say, "1/2a, 1/2b, 1/2c."

These are the ones, then, that subdivide Monocytogenes. But it's not a perfect thing because one or two, three, four of them also occur in other Listeria species. Their main use is from the point of view, epidemiology.

Next slide, please. The serotypes, although sort of indicative of the ones that are most commonly occurring in clinical cases, or the ones that most commonly occur in foods, are not perfect indicators. But I will just try and summarize the trends that are seen.

Listeriosis of any kind, whether foodborne or otherwise, is due to all types, all serotypes. But 1-2a or 1/2b and 4b are the most common types. When we come to foodborne outbreaks of Listeriosis, they are often due to larger ones, to 4b. But more recently, we've seen the 1/2b type come into play. The sporadic cases of foodborne Listeriosis are most often due also to 4b, 1/2a and 1/2b.

Next slide, please. Looking at the serotype occurrence in foods, in dairy foods, we quite commonly

find 4b, and the one type, particularly the 1/2a serotype. In meat products, we have the 4b serotype and the 1/2a, b's and c's. Plus, occasionally, 4ab and 4d.

In poultry products, we have the types 1 and types 4 and types 3. More commonly, we have the 1/2b, 1/2c. And 3b comes into play. We haven't seen that much before in the other bullets that I've shown you.

On vegetables, we find 1/2a, 1/2c and 4a, b and 4b. Coming to seafoods, another major area, we have the 1/2ab's and c's and the type 4's, particularly type 4b. I hope I haven't confused you, but I think the point is that there are trends in the occurrence of the serotypes in various kinds of foods and also trends in their occurrence in the various cases of Listeria.

Next slide, please. Coming now to the data collection, our general approach has been to collect all possible data without prejudice. I'm a very nervous person, so I like to be sure that we're going to try and get all the data. I'm afraid there won't be enough data. I have a horrible feeling, though, that there may be an avalanche of data descending upon us. Hopefully, some persons in this room will contribute data of their own. I hope so.

But doing this enables us to be choosy about

what we finally use in the analysis, what we will give to the statistician to use, or what we can pick out for him to use as he requests. So, the choice of data to use will depend on what's available and how it can be appropriately applied.

Next slide, please. What sources of data are we using? Well, we have a preference for the primary sources. We'd rather look at the original publication rather than some reference to it in a book chapter or a review. But, of course, the book chapters and reviews are good ways to find the primary sources. We're particularly interested in publications in the scientific literature or in published government documents. And as we've already intimated this morning, we're willing to consider other kinds of data. So, we're setting our net quite wide.

Move onto the next slide, please. Data chronology. This refers to what age of data we're going to be looking at. Again, we're going to consider all ages of data. This is from about 1980 up to the end of this decade. Obviously, we prefer the most recent data if sufficient is available. That is, we want our exposure estimate to be current. But if we get enough over the total time period, then perhaps we can do some

temporal comparisons. Did things change from the early 90's into the late 90's, that kind of thing.

Next slide, please. Geographical origins of data. Again, we're collecting data from all countries -- North and South America, Western Europe. We have data from the Far East, a little bit from the Mideast, a little bit from North Africa and a little bit from Australasia. We have a lot from Western Europe and a lot from North America. I guess they're the major regional areas.

Obviously, we have a preference for U.S. data. But data from other industrialized countries that are somewhat similar to the U.S. -- I like to think of England in that category -- you know, we'll consider that, too, if we have to.

So far, we've noticed, looking at the regions, that contamination is universal. It's not a surprise, of course. But occurrence rates are not -- at least, looking at it off the top of your head kind of look -- not dramatically different. That is, there's not a hundred-percent contamination of foods in some countries and zero in others. They all have some contamination between zero and a hundred percent.

Move on, please. Next slide, please. We've

mentioned subtypes. The serotypes, in particular, they're not always reported in the studies. We'll keep an eye on them and see if we get enough to do anything with, but we're not -- it's not top in our priority at the moment. But maybe if we have enough, we'll change our mind.

We have to recognize that most food isolates have tested virulent when they've been laboratory-tested. I'm talking monocytogenes, of course. And we have to assume in this analysis right now that all food isolates are equally virulent in nature. Subtype analysis of any kind -- serotype or DNA type or whatever -- is temporary, at least, not a high priority.

Next slide, please. What types of occurrence data are we finding? Well, we prefer quantitative data. But there's not an awful lot of it. But what we have will be very gratefully accepted and used. Quantity of data, I mean by the colony-forming units per gram or mil of food. It's important here to get the total number of samples examined and then the number occurring in given density ranges of contamination. And from that, we can get a percent.

Percent, per se, is useful for weighting the data between different observations. But we have to be

careful of that because, obviously, the statistics get better, the greater of number of samples examined for a given food category. Most of the data, as I've intimated, is qualitative data, presence or absence in a food. Again, the number of sample examined is important to know that from the statistical point of view. And then, from that, we get the number positive.

Often, one can get both types of data in the same study. Perhaps I should put that another way. Most of the data is qualitative data, and sometimes it is within that study. Also, some quantitative data. That's the best way to put that. I don't think we have any examples of studies with just quantitative data alone. Maybe one.

Next slide, please. Some people have questioned what's the use of presence and absence data. And I won't go into that now. But it is useful. I think it can be really just equivalent and just as useful as the concentration data.

Generally, the analytical portion used in these studies is 25 grams from a non-composite sample of the food type. Obviously, if there's a variation from that, we're going to have to correct our data or standardize it and correct the analytical portion size used. And we may

have to think about composite sample types of data, correcting that, too.

Next slide, please. Isolation method, sensitivity. This is an important factor with the quantitative data. Generally, the quantitative data are colony count data. So, we're sort of in the area of 50 to a hundred cfu's per gram is sort of the minimum level detectable, depending on the sample volume one place. But with the MPN's, depends again on the number of tubes used. But, typically, they would only be three or five. And so, we would be somewhere in this detection range, minimum detection range.

The qualitative methods, generally people are using well-known standard methods, which seem to have comparable sensitivity. And so, with those methods, we can detect at least one colony-forming unit per 25 grams. And, as I said before, sometimes both kinds of methods are used together. For instance, you screen the foods, look for the samples that are present or have Listeria mono in them. And then you say -- go back to it and count it within a day or so.

If there are under-estimates of occurrence, clearly, they will tend to err on the side of safety. More or less, they err in a safe way.

Next slide, please. This is a point that came up. We're assuming, really, in this analysis, that the analysis time and the ingestion time differential does not significantly effect the counts consumed. That is because, on average, they will tend to agree. But, clearly, a particular food might have been counted at one time and perhaps held a much longer time at refrigeration temperature before it was consumed. But this will be -- this kind of error will be less critical, I think, with the short-life products but perhaps more critical with longer shelf-life products. So, we're assuming the count will represent a potential ingested dose. That is, at the time we count the food, perhaps someone has already bought it; and then the day we analyze it, they're eating it. That's the best situation. But, obviously, it's a big assumption.

In difficult cases, we may want to look at survival studies for monocytogenes in critical products. There's plenty of data on survival of monocytogenes in various kinds of foods.

Next slide, please. But what about the foods themselves? Well, the main emphasis clearly is on ready-to-eat foods. These are not always clearly defined in the contamination studies we're looking at. We're also,

though, going to look, I think, a little bit at undercooked foods -- that is, partially-cooked hamburger and that kind of thing. It is possible to make some ballpark estimates of the levels of mono one might ingest in a partially-cooked hamburger. We're not really looking at rewarmed, cooked, chilled foods or cooked leftovers. We're not really considering that so much, how well they were reheated and that kind of thing.

We're collecting data on raw foods. But, again, it will be difficult to use that in this analysis. Not many people are eating that much raw food, I believe. And then, of course, I think we've already talked about this. But there's the harmonization of the contamination of dietary data. We're going to have to have appropriate pooling of the food-type data.

Next slide, please. You're going to hear more about the groups of foods that are being studied in regard to the dietary or ingestion data. But we've done some partial harmonization looking at our contamination data, talking to Mary Bender and the Dietary Intake Group. And so, we have a major category of dairy foods broken down into cheese, ice cream, milks and something called miscellaneous, which could include butter and so on. And, again, some of these categories are broken down

into appropriate further breakdowns such as soft cheese versus others, or raw milks versus pasteurized milks.

Next slide, please. Fresh produce. We're concerned about vegetables that are eaten raw here in salads or sandwiches -- those that are grown in the air away from the soil and those that are grown in the soil. Clearly, these might be more likely to harbor Listeria monocytogenes. There's something called miscellaneous vegetables, catch-all. And then we have fruits that are eaten raw, those that grow or are grown near the soil and those that are growing distal to the soil. Seems an appropriate breakdown, if possible, in regard to potential for contamination.

Next slide, please. Juices, we're looking at fruit and vegetable juices, pasteurized and raw.

Next slide, please. I should say that with all these groups that we've come out with, this is a tentative list. I don't say we have much or even any data for all of them at the moment.

Salads, vegetable, fruit and nut salads -- that is, salads without protein added, animal protein items added. And then your other kinds of salads with the animal protein items. And something called miscellaneous mixed salads.

Next slide, please. Coming to the meats. We break each kind of meat down into raw, ground and cooked meats, in general. And we have here the beef, pork, lamb and poultry as the major groups.

Next slide, please. Other meats and products are important, of course, in the ready-to-eat area. We have our deli and luncheon meats, the bolognas, the hot dogs, fermented meat products and other kinds of meat products. We have sausages. I presume this includes things like bologna and -- well, bologna is up here. But salami and so on. The meat jerky. I have something for exotic meats. Meatloafs, spreads and pates. And then the egg products have been put here.

Next slide, please. Very important category in the ready-to-eat area, of course, and the food preparation area is sandwiches. Broken down into burgers -- the cheeseburgers, hamburgers. And then deli items, the various meats, eggs, seafood and veggies.

Next slide. I think this is the last major category. We're considering seafoods of the ready-to-eat and raw type. In fish categories, the shellfish, smoked seafoods, and then anything else.

Next slide, please. We have a few other food categories that seem to be miscellaneous in character.

But we have Mexican-style cheese and on-cheese dishes. Some kinds of salad dressings such as blue cheese and things like pastries that are cream-filled.

Next slide, please. Our results, we have over a thousand lines of data, 400 kilobases. Seems to vary whether you move one line from the database or add it back in. It can change going low. But, anyway, gives you some idea of the collection so far. They're in various separate data bases by the members of the work group at the moment. So, they're gonna have to be combined. And we've essentially covered seafoods, vegetables, cheeses, meats, poultries and sandwich. That is, we haven't covered all the data on these items. But we have fair amounts of data on all of them. And, as I mentioned before, the milks are just being started, raw milks and pasteurized milks.

Next slide, please. In the document that you probably have or I hope you have got out front, some of the kinds of data we have are in there. But just to run over briefly the kinds of data that we're collecting and data base so we have a reference, this happens to be an acronym for the West North Yorkshire Joint Working Group that's been published in '91. Large survey in the UK. So, we have the country, and then we'd have the food

types examined by the work group. And then the components, type of food and the categories. So, we'd have a deli item with meat in the sandwich category. And then we'd record whether it's ready-to-eat or raw. And then what the species is -- hopefully, monocytogenes.

Next slide, please. This is the continuous data base sample a little more. Here were the data for this kind of sandwich. And they looked at 47 and found 7 positive. One of them, they didn't get any quantitative data. The other six, they got various kinds of quantitative data for the six, the six positive ones. So, 1 out of 46 had less than 20 cfu. They were plating half a mil, so pushing the plating technique.

2 out of 46 were in this range. 1 out of 46 were in this range. And 2 were greater than a thousand cfu per gram. And they used the 25 gram sample for analytical portion size.

Obviously, we'd like, really, to get a lot of data like this because it gives us some kind of distribution of the various concentration levels, how frequently they occur. In this particular example, there seem to be quite a lot of high proportion of high-level contamination. But that's not always true when you look at other foods. So, that gives you some idea of the

kinds of data we're collecting.

Next slide, please. Obviously, we have to complete our data gathering. And, hopefully, we will get some more from volunteers outside of the Government. Finish the milks, in particular. We've got to combine the data bases and make them consistent. We've got to edit it and pool the data into the categories that I've sort of mentioned. Then we can sort the data into all Listeria species or just monocytogenes species data. And we can sort it into density or presence and absence data. Though that isn't quite so important, I've decided. We have to select amongst the data for the ready-to-eat versus the raw. And we have to collate it with the dietary data.

So, as I said, we're being quite Catholic in our collection of data. We're grabbing everything we can get hold of. I think that's gonna be important in terms of determining at least an overall frequency distribution of the data because, obviously, we're interested in any kind of contamination level. But we're particularly interested from the point of view of possible disease in the: how frequent are the higher levels of contamination in the various kinds of foods; how frequently does a food type have a count of, let's say, ten to the three to ten

to the four? And, hopefully, we'll be able to correlate that with frequency of disease. Get a match-up, if you like, a titration.

Next slide, please. So, the results will be estimates of the amounts of viable Listeria monocytogenes in U.S. food and food subgroups. And the estimates will be in the form of pathogen and cell density frequency distributions.

Next slide, please. I don't have to introduce the next speaker because I understand the committee is going to answer any questions there might be on this. But to review what we've covered, we've looked now at the contamination module, the contamination rate for monocytogenes in foods, and that the data collection for that, that has to be multiplied by the consumption rate to give us an exposure rate. And then that exposure rate has to be used to derive some function which will give us the frequency of Listeriosis and, in particular, foodborne Listeriosis, relate these to, in a risk analysis by the statistician.

So, without anymore ado, I'll close and let the committee introduce the next speaker. Thank you.

MR. MICHAEL JAHNCKE: Thank you, Dr. Hitchins. Are there questions from the subcommittee for Dr.

Hitchins, please? Dr. Hitchins, if you could just wait a minute. There are some questions from the subcommittee. Dane Bernard, please.

MR. DANE BERNARD: Thanks. Dane Bernard. Thanks for your presentation, Tony. Looking at the data that you've already collected -- and I recognize that you're not very far on the dairy portion of your data collection -- but what would you say would be your greatest need and what are those product areas?

DR. TONY HITCHINS: Well, that's a good question, Dane. It depends on what you mean by, "need." But, for instance, in the area of fruits and fruit juices, I wouldn't say we had very much, if any, data. But whether there's a real need for it, I don't know because -- it would be nice to know what's there, you know, that kind of thing.

I think dairy area is fairly well-covered. Seafoods is pretty well-covered, but one doesn't always know what they mean by, "seafood." They tend to lump things together, and one doesn't always know whether it's ready-to-eat and raw together and so on. So, that's going to have to take careful sorting.

Meats, we have a lot -- I think that's the major groups. Have I missed one? Sandwiches. In this

country, I would say sandwiches -- approaching your question another way, we have a lot of data from various categories worldwide. But in any given country, we may not have much data. And we have a lot of data on sandwiches in Northern Ireland. But, you know, maybe we need more on sandwiches in the U.S. Yeah. Thank you.

Quantitative data is needed, too. As I mentioned, though, the presence and absence data is, if you think about it very carefully, a set of quantitative data. It does reflect a distribution. The shape of that distribution, one can either make assumptions about it, or one can look at the quantitative data we have and see whether the distribution is something we might expect, such as a log normal distribution or whether it differs from a log normal distribution.

So, I believe the presence and absence data will tell us a lot more than just presence and absence.

MR. MICHAEL JAHNCKE: Mike?

MR. MIKE DOYLE: Mike Doyle. Tony, a couple questions. Would you be asking for the methods that are used to generate these data? And, if so, will you take the methods into consideration as to whether the data are acceptable or not?

DR. TONY HITCHINS: Yeah. Thank you, Mike.

Any data we get, you know, we'd be glad to see the method. I think it should be -- if you can tell us the method, too, that would be very helpful. Particularly if it's a method that's perhaps not one of the standard methods such as the FDA method or the FSIS method or the Dutch method or the Nordic group method. You know, if it's not one of those, then we'd like to know it, I think. It doesn't mean to say it's not any good. But we would like to know, if possible.

MR. MIKE DOYLE: You mentioned sandwiches as a classification. And I think that's great. But what's in the sandwich is probably more important because salami might be different than chicken salad, for example. I think you may want to break those out into sandwiches and the various ingredients within those sandwiches, rather than lumping it into one group.

DR. TONY HITCHINS: Right.

MR. MIKE DOYLE: The other question I have has to do with sprouts. I didn't notice that up there. And certainly, we have a strong interest in sprouts today. And I wonder if there might be a focus in that area.

DR. TONY HITCHINS: Well, with regard to the sandwiches, we have a crude resolution there into the meat and non-meat types of sandwiches. And I think the

breakdown is really going to be limited to what is available in the data. I mean, you know, if we have a lot of chicken sandwich data and we have a lot of salami sandwich data, that's fine. But if we don't have much, we're sort of reduced to pooling into a category of meat sandwiches or, perhaps, poultry sandwiches versus meat-type sandwiches and seeing what we can get out of it.

But you're quite right. Ideally, we would want those to be separated. Sprouts are not specifically mentioned. Perhaps they should have been. And I would put them in there somewhere, I think, under fresh vegetables. Do you have a disagreement about that, or would you rather have that kind of product separated out?

MR. MIKE DOYLE: I just want to make sure we don't overlook sprouts.

DR. TONY HITCHINS: All right.

MR. MICHAEL JAHNCKE: Peggy?

MS. PEGGY NEILL: Peggy Neill. I just wanted to go back and just ask you to clarify. Maybe I just missed it. A couple of things. One is: In order for the data to be acceptable to be included in the data base, it will need to be a isolation as opposed to a molecular detection method? Is that correct?

DR. TONY HITCHINS: Well, speaking as a

regulator, we always like the data to be for the organism that is being isolated and we have it in our hand. But I think for the purposes of this exercise, I think that molecular type presence/absence or quantitation data would be useful. Yeah. I mean, would be acceptable to me, anyway.

MS. PEGGY NEILL: At least to look at -- although, then, hard to know whether at this point it would necessarily go into the data base?

DR. TONY HITCHINS: It can go into the data base certainly, yeah.

MS. PEGGY NEILL: Okay.

DR. TONY HITCHINS: But whether we use it -- any data in the data base may not be used in the analysis, okay. You know, that's going to be our statistician and other people's choice what is actually used. I hope I've given the impression that we'll accept any data, and then we'll see what we've got, what we can do with it. I mean, obviously, you have some ideas already what we can do with it. But, no, that data will be very acceptable, Peggy. Yeah.

MS. PEGGY NEILL: The other point that I wanted to make sure that we all understood was that you had fairly early on a slide in which you were addressing how

not all of the studies may have sub-typed or serotyped isolates. But then you also made a point that you will be includ -- the assumption is basically that all L.M. are virulent regardless of whether additional virulent --

DR. TONY HITCHINS: (interrupting) That's my personal assumption. Other people may not agree with me. I mean, obviously, not all L.M. are virulent. There are certain types that are not virulent. But they're not terribly frequent. So, one is isolating those rather rarely. Yeah. Did I answer your question?

MS. PEGGY NEILL: So, the assumption for inclusion in this module is basically if L.M. --

DR. TONY HITCHINS: (interrupting) Any L.M., yeah, you know, we found L.M. in X samples of food product by this method.

MR. MICHAEL JAHNCKE: We'll have one last question. Then we'll save it. We will have a committee discussion a little bit later. Bob?

MR. ROBERT BUCHANAN: Bob Buchanan, FDA. Tony, the scientific literature has basically two primary sources of information about Listeria in foods. One of them is the survey data that you have indicated you're going to incorporate in your data base. The other is a rather extensive literature on inoculated pack studies in

determining what foods will and will not grow Listeria, under what conditions or growth rates, et cetera. I didn't see any indication at all that you planned to use that one whole group of data.

How are you going to handle the research that has been provided in terms of inoculated pack studies, experimental growth studies, et cetera, which probably has the best quantitative data that is available because it's been done under usually fairly controlled conditions?

DR. TONY HITCHINS: Well, I sort of agree with you that we, perhaps, should make use of that kind of data. But I can't quite see how putting ten to the three Listeria into a food and seeing what happens to it has usefulness as telling us what is out there and what is consumed by the public. It tells us things about how likely it is a contamination with mono will develop into a larger population of mono in the food or whether it will decline or stay constant. And that would be an important breakdown in terms of the same, "Well, these are the foods in which mono will grow."

Is that what you mean?

MR. ROBERT BUCHANAN: Not only grow but to what level. It just seems to me that you're missing an entire

source of data that needs to be capped or at least examined in some way.

DR. TONY HITCHINS: Well, you know, that wasn't in our mandate, I guess. It was to see what the contamination of foods was in nature, not in the laboratory in terms of inoculating them. But we can certainly incorporate those kinds of data if people care to send them to us.

MR. MICHAEL JAHNCKE: Excuse me. To stay on schedule, we will have, after Dr. Bender is in a break, a general committee discussion. We can continue on with this discussion. But to stay on schedule, I would like to thank you, Dr. Hitchins, for a very well-organized and very excellent presentation. Thank you very much.

Our next speaker is Dr. Mary Bender. And she will be talking about food consumption patterns.

DR. MARY BENDER: Thank you. Yes, I would like to bring you up to date with the progress that we've made so far with our food consumption module. If we had an unlimited amount of time, we would probably not really get into it heavily until Tony has finished his first module. But there was no way to do this, so we've kind of plunged in headfirst and are really in progress of still addressing the issues.

First, I would like to bring your attention to our team. The team has evolved over the last three-and-a-half months that we've been doing this. I work in the Office of Food Labelling at FDA CFSAN. I'm not sure if anyone has had microbiology. I have, and I'm a research methodologist statistician. But we do work with the food consumption composition sales, labelling, whatever data bases, and do use data provided by other agencies and also do data collection, have it available to the world.

Also, the team has worked with consultants from ARS and from CDC on their specific data collection tools. And it's been very, very helpful.

The purpose of this model is to model a consumption of foods that have a high potential for contamination by Listeria monocytogenes, which brings us to the first question of what foods are at greatest risk for contamination. And not having a background in Listeria monocytogenes -- I've heard about a few outbreaks related to cheese or hot dogs -- and I thought, "Oh, this will be a piece of cake. Put in a little bit of computer code and come out with what's there." But looking at the literature, it was very apparent very quickly that Listeria is in many, many foods, as Tony and others have mentioned. And so, trying to look at the

case data for Listeriosis, the outbreaks, the sporadic cases.

Also, recalls by the U.S. government and Canadian government, as well as some of the analytical testing data, although I didn't really get into that too thoroughly.

As Tony mentioned, Listeria is in many raw, unprocessed foods and at grocery refrigeration temperatures. And freezing doesn't necessarily kill it. And it can be heat-resistant. Cross-contamination in the home can spread Listeria. And it may be on foods that are ready-to-eat.

Next. Which brings us to the next question: First reaction was just to make all these foods more manageable. We should look at different groupings. Also, it's critical that we do look at food categories in order to allow the merger of the data from the contamination module and the consumption data. And they don't necessarily merge easily. So, it is a challenge that we're continuing to address.

Our categories are evolving. Tony listed the categories, and I'll go into a little bit of the information. We have several meat categories. I know there's a lot of analytical testing data on various

meats, recalls also.

Next. Poultry, I know there have been some outbreaks related to poultry, sporadic cases that have been cooked. Deli-luncheon meats is a very important area, especially with the latest outbreaks and also a number of recalls in the last, I guess, six months from the Midwest, but recalls from a number of places.

We're still trying to get the sausage categories straightened out. Luckily, the hot dog/sausage website did have some kind of explanation of the various sausages. But we're thinking in terms of like salami and pastrami or whatever going in the fermented area. But I don't know. Tony and I are still working on this.

And then the deli meats listed there, as well as miscellaneous bulk and link sausages. And we had thought that that was primarily like the breakfast sausages, because there have been recalls related to those areas.

Next. Listeria has been identified on jerky. And as far as exotic meats, we not only mean the game meats like venison or buffalo or rabbit, but also exotic concoctions. There was an outbreak in Europe related to pates, and I know ham roulettes. And there was pork

tongue in jelly -- and I don't know who would eat that anyway, but maybe it's really good. But we do want to cover whatever we can find.

As far as fruits, we've been able to find very, very small amount of information in the literature. I did find one article on AIDS patients and Listeriosis and contacted Dr. Mescall (phonetic) at Los Angeles County Health Department. She was thrilled to death that we were doing this study and said that they had unpublished data on unwashed grapes. And she also mentioned a vegetable I had never heard of called jicama, that apparently it was like a potato. But you eat it raw and slice it. And they did find data that they didn't publish.

In one of the really good textbooks, it's a Riser and Marth [phonetic]. And the update came out this year. They cited an outbreak related to strawberries, blueberries and nectarines. And so, I ordered Dr. Schlech's article and read it. And none of the people on the team contacted him. And he referred us to a Dr. Lin at CDC, I believe, who is in Viet Nam -- and we haven't heard from him yet -- to find out exactly what this outbreak was.

I know Tony did find analytical data on plums

and peaches and raisins. But we need to identify fruits that could be a problem, and I'm not really sure what they are. I know there was a recall of frozen blueberries within the last year, was another one. But I don't know what to do with that yet.

Okay. Next. As far as vegetables, we have it broken into those vegetables eaten raw and miscellaneous vegetables. And the raw, with the raw vegetables being broken into those grown above the ground and below the ground. I know there was one outbreak in the U.S. that was -- I guess there was some epidemiological link to lettuce, tomatoes and celery. Well-known outbreak in Canada related to coleslaw, which is the cabbage. Sprouts. We did get sprouts in there.

Within the last year, there were a number of recalls of various kinds of sprouts. They looked like they were processed, though, because they had crunchy sprouts and dill sprouts and whatever. But that's how sprouts made it on the screen today. Grown below the ground. And radishes. I know that there's analytical data on a number of vegetables with not a lot of results. But the radishes did show Listeria, as well as some potatoes. But I'm not sure who eats raw potatoes, so I didn't put it up there.

Next. Listeria is a very big area for Food and Drug Administration. For cheese, it isn't going to end up being as simple as soft and other. But I'm not sure exactly where we're going to go with that. Again, it rests a lot on what Tony finds with the contamination data. But there have been outbreaks -- a well-known one in the United States with Mexican cheese, and various outbreaks in Europe.

As far as ice cream, I did see that there was an outbreak related to ice cream. And there have been recalls of ice cream and ice cream products with Listeria.

Fluid milk, we're still working with this. And there will be some slides later where I go into it a little bit more deeply. But there have been outbreaks in the United States linked to pasteurized chocolate milk. And another with -- I think it was Holland -- maybe 2 percent lowfat milk. And outbreaks in other countries from the raw milk.

We have a category for miscellaneous dairy products and know there was an outbreak related to cream, butter. There have been recalls related to the other products listed up there and probably some additional ones.

Seafood is an important area. I immediately jumped down to smoked seafood because that's most of the literature that I have found that has linked Listeria with outbreak due to smoked mussels in New Zealand and Australia. Another outbreak related to smoked rainbow trout. That was someplace in Europe and sporadic cases also with smoked salmon and smoked cod roe.

I know that there have been -- I'm not sure what -- I guess recalls related to ready-to-eat seafood. And so, this really is an important area. And I'm sure we'll get into these categories and look at the relationship with Listeria.

This one broke my heart. Tony found some analytical data for cream-filled pastries, I believe, in the United Kingdom. And my first thought was, "Good. It wasn't here." But I know that there have been recalls related to whipping cream and other dairy products, so the possibility does exist.

I found very little information on juices. There was one article that came out of FDA in Seattle where they tested fruit juices and found Listeria in unpasteurized apple and apple-raspberry juices. And I did contact the author who said that it was, I guess, in a jar. It was jarred juice. It was unpasteurized. But

they did not test for levels of Listeria. It was strictly presence and absence.

Salads are also important. I know there have been recalls related -- I'm kind of jumping around -- to different types of meat, fish, salads. I know that there have been several outbreaks related to potato salad in this country and others. I don't have details on that. Hummus, there have been recalls related to hummus, various types of hummus, and that analytical testing, I think, primarily -- I believe Tony said in Ireland -- I know it was in the United Kingdom someplace -- where they did look to see what ready-cut salads had Listeria. And I know the International Cut Produce Association is really interested in this area and is doing everything they can to try to provide us with safe cut salads.

Again, we've isolated or we've put down burgers and deli. I'm wondering if we'll end up including hot dogs also as another category. I know the USDA regulates meats; but if you put it in a bun or between bread, it falls into FDA's jurisdiction. So, we are interested in the sandwiches that have been implicated with Listeria. I know there have been a couple recalls of frozen cheeseburgers. And I have no clue to what level you'd have to heat the products in order to eat them. But they

have had Listeria, and they have been in recalls.

Other foods. This is still evolving. I'm not sure where Mexican-style foods will -- whether it will continue in here. There was a recall related to chicken burritos, a recall related to blue-cheese salad dressing. And one book had raw eggs implicated an outbreak in the U.S. But I haven't been able to get any further to find out if that was really true.

Okay. Which brings us to the next question as to: What are the best sources of food consumption data? There are two large-scale U.S. food consumption surveys. And those are the tools that we're going to use to answer our questions. First is an ARS survey that has been going on -- I don't remember -- 20 years. Maybe more than that. I can't remember. It's known as CSFII, the continuing survey of food intakes by individuals. And this is the most current food consumption data that are available.

The survey collects two, 24-hour recalls of foods eaten. It is a probability sample of respondents. And the survey does have weights whereby you can look to find out -- you weight the sample size and also weight the amount eaten. And it will give you a national probability sample. But it is food that is eaten, non-

institutionalized people.

So, when you get down to the bottom and see the number of respondents, it would not account for adults 65 and older who are living in nursing homes or other types of assisted living. Also, the sample of pregnant or lactating women is not actually large enough to be nationally generalizable. But this is where we are with this.

CSFII has collected data under an EPA contract for children, and there will be a lot of data available to EPA at the end of the year and to FDA and others right after the first of the year. But maybe later we'll go back and pull in those data. But it won't be ready in time for this survey.

The second survey is not strictly food consumption. It's the National Health and Examination in Nutrition Surveys. And these have been conducted by CDC by National Center for Health Statistics in D.C. area for a long time. I don't remember exactly. These data are older than the CSFII, and they do have one 24-hour recall of foods eaten. They do also have test measurements, body measurements of the respondents. But to our chagrin, none of the measurements could really be used to determine immunocompromized conditions.

It's a probability sample. They provide weights to reflect the U.S. population. Many respondents -- probably a large sample of pregnant or lactating women, but probably not large enough to really be truly representative, even though it's weighted.

I believe OMB of the government is the source that asked CDC and ARS to combine their surveys. So, starting in 2000, there will be separate data collection, but they'll be using the same sampling design. There will be a number of other changes. But future data will be -- they'll be able to combine the different groups. And I know that they're going to attempt to collect data on more pregnant or lactating women. Last year, we looked into seeing if we could give them funding to double the sample. And that was -- I think it was something like 500,000 for each agency. And that didn't include the testing. So, there are a lot of consumption data available. And it just didn't look like the best place to invest the funds.

The next question: I saw somewhere where there were 7,500 food codes. And we are looking at all of these food codes to figure out exactly what should go into the pot because, obviously, all foods are not implicated. Until I hear differently from somebody who

knows a lot more than I do, we aren't going to put bread or cookies or a number of foods.

This is just one example. I know there were over a hundred food codes linked to cheese. And there will be some later slides that explain what we've tried to do. Some of these cheeses would be at greater risk and others wouldn't.

The next question: What measure of food consumption will best represent exposure? Both surveys provide data as the amount eaten in grams per eating occasion. And I know CFSAN issues those data a lot in order to figure out serving size because Congress said in the early 90's, "You will figure out the serving size based on the amount of food that's customarily consumed." So, we will have data in eating occasions. But speaking with the modeler, Clark Carrington, he said he would like the amount eaten per person per day. And it will be in grams. And we can also figure the proportion of the population who are eaters, and that's really important.

Our steps. We will select the appropriate Food Codes and for each Code determine the amount of the food eaten per person per day in grams. Weight the data to reflect population. Sort the data in to the groups that we've mentioned earlier. And then, in some instances,

merge data from CSFII and NHANES. And I'm not sure how often that's going to happen because the more we look at it, the more we see that that is not totally a good idea. But we will just see.

Okay. There are limitations, under-reporting as well as over-reporting. This is a problem. It always has been a problem. It always will be a problem. Partially because people don't remember what they eat, and partially because a number of people might not want to say that they had twelve doughnuts. But both of the data collection agencies realize that it is a problem. And when I mentioned this when I met with them, they said, "Yes." So, we're gonna consider this as a limitation and with no known correction at this point.

Different weighting factors for each survey mentioned this. The first example that the programmers pulled out sort of blew me away when we looked at the eating occasions for raw, smoked and pickled seafood and came out with 79 from CSFII and 87 from NHANES. And then I looked to see, "Boy, you look at the weights." And you say, "Boy, 1.6 million. And the 1.5 million. This is great." But then when you start to look at the sample descriptives, there's a problem. There's another problem here.

Now, if you look at the -- for CSFII, as a rule, medians are really the best estimate for food consumption data because the data tend to be skewed. But you look here and you say, "Wow, these are fairly close." And even when you weight, the data comes out fairly close. And if I go back to intermediate statistics, I think, "Oh, well, maybe the distributions are normal." But they're not. So, then when you look at NHANES and see a median that's higher and a mean that's way off the board, it's one of these where you go back to the raw data and see what was going on.

And there was a 19-year-old Hispanic male who ate a ton of raw oysters. And when I talked to the people at NCHS, they said, "Oh, yeah. We know that guy." So, and even if you weight the data, you come out with parameters that are not close.

Next slide. This is not a perfect slide, but I wanted to come up with some idea of what the distributions look like. So, if you look at the XX's and see the amount eaten grams, and then the number of individuals in thousands -- this is weighted data -- you can see that from NHANES, which is the yellow bars, there were more eaters of small amounts. Now, I'm not sure -- I guess 28 grams and whatever would be an ounce. So, it

looks like there were a lot of eaters of small amounts. And then the guy -- or I'm not sure who all, up at the top. But these are different distributions. And there's no way you would combine these two weighted distributions, even though you go back to the original sample sizes and see that there are not many eaters in those surveys.

Another limitation is individual ingredients from mixed dishes. And I know this comment was mentioned earlier that -- we can look at beef, or we can look at cheeseburgers and hamburgers. And I know there were 43 Food Codes of burgers. But if you want to pull the beef off, which makes sense, it means picking out the Food Codes and going into the amount eaten per person per day in grams, and then looking at a proportion of the overall, which would be the beef.

Varying sample sizes of food groups. Not only is there a challenge when you have a low sample, but if you take consumption of fluid milk and come out with -- who knows how many data points -- it would not even probably fit in a computer. It isn't gonna work. And so, we've been talking to the modeler and figure for some of these foods -- and then, of course, if you take and look at the entire group, you're gonna have many, many,

many of the foods. We will probably look at percentiles to figure out what the data are at the first percentile and the second and the third. So, at least there would be a hundred data points for him to work with. I don't know what difference this will make to overall exposure estimates, but this is one of the challenges.

A limitation is merging the data from the earlier module and this module. And, again, it really will be important to see what Tony and his team is able to find. And then we need to adjust according to them. They don't adjust according to us.

Then we went over this last week one day. And someone sent me an E-mail that said, "Don't you think it's a limitation to have one or two days of eating?" Absolutely. But when you work with data all the time and you know it's the best that's supposed to be out there, sometimes the obvious isn't always clear. But, yes, this is definitely a limitation. And when these two surveys attempt to integrate, there may be data collection over the telephone instead of in-person. And there may be one day of eating, or there may be only a subgroup where they can get to the people in person and talk to them. But both agencies are doing a lot of highlighting to try to find out what works.

Okay. Risk assessment always has to include uncertainty, and one source that is very implicit in our module is that we want to have a reasonable proportion of the food consumed that would model the consumption.

One example is with fluid milk. We looked at CDC's behavioral risk factor surveillance systems survey; and their latest data -- I believe that's the latest data -- indicated that 1.4 percent of the respondents said that they drink raw milk. And so, we're right now working under the assumption that if we look at fluid milk consumption, that 1.4 percent would be unpasteurized. We're still trying to figure out whether to put most of the risk in unpasteurized or to look at the pasteurized. Pasteurized milk will be included, but I'm just not sure where that will go.

And also, there was some data from CDC that fall into assumption to -- where they said 5 percent of unpasteurized milk contains Listeria. So, possibly this is going to limit the amount of milk that's really at risk.

Okay. You'll learn a lot when you do these new projects. And I was very surprised to find that over half the states -- actually, 28 allow intrastate, the intrastate sale of milk. These are the 27 that allow the

sale from farms. Luckily, the BRFSS I just mentioned did include Missouri and New York. For milk, they did not have a question for South Dakota. So, some of their states were in that survey. And I know for one of them, the proportion of people who said that they drink raw milk was a little bit higher than the other ones.

Two separate columns here. Eleven states allow grocery stores to sell raw milk. Six states allow restaurants. And then the list is getting smaller. But some states even allow the sale of raw milk in schools and in hospitals. Surprise. I was surprised. You may not be.

Next. Listeria is not on this slide, but we did just find one article that was published last year that linked outbreaks to raw milk. Now, I'm not sure if "unknown" includes Listeria. But there are problems.

We go back to our burgers again. And the BRFSS reported that just under 20 percent of the respondents reported that they eat pink hamburger. Now, I don't know what proportion of the burger would be pink -- probably not the outside -- but at this point, our assumption is that 19.7 percent of the ground beef consumed is undercooked and at greater risk.

You could spend a couple years on cheese. It's

really fascinating. But we've tried to look at the type of cheese, the category, the pasteurizations required, the implication in cases and recalls. And then our team is given an overall risk designation. I'm not sure where that's gonna go.

Type of cheese. They appear to fall into these four categories. You just can't say, "soft cheese" because, I mean, there have been cases linked to feta cheese and outbreak -- that one Mexican-style cheese is listed. Cream cheeses, there have been recalls. I don't know that there's been that much a problem with cottage cheese. So, it isn't fair just to say soft versus other.

There have been outbreaks linked to soft, ripened cheeses, both in this country -- I know they've been epidemiologically linked and also in Europe they have been linked.

Okay. Semi-soft cheese. I believe everything up here has been linked to either some sort of case or to a recall.

Hard cheeses. I haven't found much problem. A lot of the literature that Bob Buchanan mentioned where you inoculate and see what happens, I've seen literature on these cheeses, but not too many problems that I'm qualified to address, anyway.

You would think the processed cheeses wouldn't be a problem, but there have been recalls linked to cheese spreads and various types of cheese pack foods.

We receive literature from our Land Foods. That's not the total office title -- but the fellow who's a cheese expert -- and he brought out the literature and said this is how cheese production in the U.S. is broken down, which would at first glance indicate that two-thirds of the cheeses that we produce here are at less risk. But the other little over a third doesn't always-- it isn't very clear-cut.

I was surprised to find out that some cheeses are pasteurized, or else the milk is pasteurized first, but that there are also heat treatments and the temperature is not as high as pasteurization. So, like the sharp cheddar, there still could be some kind of risk. We've contacted Dr. Johnson, Wisconsin -- I'm not sure where. And he is going to have his people look at later data to see if it still falls in this proportion.

Now, the earlier slide was U.S. production. And that doesn't include what we import. And I don't think that it's fair to say that what we import is at greater risk. But these are some data from the National Cheese Institute where you can see that Camembert and

Brie, which is part of the cheeses that have been linked to outbreaks in different parts of the world. 50 percent we import, as well as Gouda and Edam, and in a smaller proportion. They did not have data for the amount of Hispanic cheese that we import.

So, we have come up with our own little risk designations with the lower; and then if there's been a recall, we move the lower to the higher. And then if the cheese has been associated with an outbreak or spreaded case, then we move them up to the highest risk.

One example would be blue cheese. It's semi-soft cheese. Pasteurization is optional. It is not required. It has been implicated in recall outbreak. I believe the outbreak might have been in Denmark. I'm not for sure. And so, blue cheese is one that will be coded at highest risk.

Juice. FDA is currently working on important juice HACCP regulation. But the one last year, the economic people put together a lot of data sources. And we're able to estimate that 1.7 percent of the apple and orange juices consumed is unpasteurized. And, therefore, it would be at greater risk. That's how the assumption, how we're wording the assumption.

I did find one article that -- again, I don't

understand the microbiological aspects. But it did explain that some products at high acid, like orange juice, could maintain Listeria. So, I don't know exactly where that's going to go. A slide that I don't have -- because Dick and I just talked about it on the way here-- is: What do you do with frozen produce? I know that there was one outbreak related to frozen broccoli and cauliflower. And so, went back to Texas -- ordered the article and called Texas State Health Department. And they said that there were, indeed, people who -- well, they considered it an outbreak along the Texas and Mexican border. And they were able to go back to the stores and find Listeria in their frozen product.

They didn't have a clue what the people did, whether they ate the frozen product out of the bag or maybe they didn't cook it high enough. But there was a problem here. And then I mentioned earlier with Listeria in a well-known brand of frozen blueberries. And so, I figured that there might be some way to go to -- we have sales data from A. C. Nielsen and from Information Resources -- and figure out how much of the packaged frozen product is sold and then possibly go to commodity groups or produce marketing association, figure out what is sold raw. And then maybe come up with some way to

consider the frozen vegetables. Because there's no way you would go to food consumption data bases and see that anybody says they've eaten frozen broccoli. You know, it's either raw or else they've cooked it or put it into a mixed dish.

I'd like to leave you with the thought that we are using the best U.S. food consumption data available. We are considering limitations -- data bases are not perfect -- and attempting to reduce uncertainty as much as we are able within our tight time constraints. Thank you.

MR. MICHAEL JAHNCKE: Thank you, Dr. Bender. We have about five minutes for general questions from the subcommittee. And we will go to a break and then have a full discussion with the entire NAC members with all the presenters.

Are there questions from the subcommittee? Yes, Catherine.

MS. CATHERINE DONNELLY: Cathy Donnelly. Mary, I really enjoyed your presentation. I'm wondering if you've given any thought to breaking out of, especially the continuing survey of food intake data, maybe regional differences or socioeconomic trends.

DR. MARY BENDER: They do have some of those

variables. So, in addition to the age groups, it's possible. It's just that when you get down to the cells within the overall survey, it just -- you know, hopefully they'll be a large enough sample to make sense.

MS. CATHERINE DONNELLY: But I'm thinking with certain food consumption trends, there really are regional differences.

DR. MARY BENDER: Right.

MS. CATHERINE DONNELLY: And that might be useful in the data.

DR. MARY BENDER: Right. Thank you.

MR. MICHAEL JAHNCKE: Bob?

MR. ROBERT BUCHANAN: Bob Buchanan, Food and Drug. Mary, again, let me echo. A very nice, interesting presentation.

I guess one of the questions I have is: Since Listeria, Listeriosis primarily affects the very young and the very old or people that in some way have suppressed immune systems, your working assumption is the dietary patterns of these individuals are not in any way different from the patterns you're seeing in the rest of the population; or I didn't pick up anything in your presentation.

Do you anticipate any kind of a problem in

making that working assumption?

DR. MARY BENDER: This is a problem and something that we're definitely still considering. I know that there was one article -- maybe a couple -- that were in the United Kingdom where they looked at pregnant women and then women as a proxy, women in child-bearing age. And they did look at their consumption and found out that there was very little difference. So, I've tried to reach some of the nutritionists in our center to see if they have a comment. But nobody has gotten back to me about that.

It's a problem. I mean, we can come up with aggregate estimates for the population, and I know that that isn't going to be adequate. But I hope that we can do something within the time frame. But last year, I spoke a number of times with people from CDC; and they were willing to go out and collect data from pregnant women from their sites. And also, CDC and ARS were willing to double the sample pregnant women. But it didn't work out that we had the funds that would go toward this data collection. And it wouldn't be ready anyway.

As far as the immune-compromised people, I know there are some variables on some of the data bases.

Like, we could pick out people who either say they have diabetes or who are being treated for diabetes, possibly some other conditions. But when I spoke with CDC about this, the National Centers for Health Statistics say that NHANES is the wrong survey. You're not going to be able to determine who was immunocompromised.

And I know people in our Center have spoken with those folks about including data, some other measures in the future. But I don't know where that has gone. So, we do have a problem. We could find the children, and we could find older people who are not in institutions.

One thing that I did learn is that over time, a lot of people have moved out of nursing homes into home situations where the -- I guess Medicare will now -- Medicare, Medicaid, I can't remember -- I'm not quite there yet -- it's getting closer -- where they will provide support in the home for the people. And so, because of that, the likelihood would be that there would be better data on older folks.

Something else that I did find in the literature was that a lot of people in nursing homes have a very restricted diet. And many people don't eat anything compared to what we eat, anyway. And so, we

know that these are problems. And it's actually a major limitation and should be included. So I can't really answer your question, but we know it's a problem and we're gonna work on it.

MR. ROBERT BUCHANAN: Is there any data available through programs such as Meals on Wheels in terms of the patterns, consumption patterns?

DR. MARY BENDER: CSFII captures some of the Meals on Wheels data. But I don't know.

MR. MICHAEL JAHNCKE: Thank you, Dr. Bender, for a very thorough presentation of a very complex issue. Thank you very much. It is time for the break. We will reassemble promptly at 10:15. At that point we'll have a general committee discussion with all the presenters. So, hold your questions and there will be plenty of time. Thank you very much.

(Whereupon, a recess was had in this matter.)

MR. MICHAEL JAHNCKE: Welcome back, everybody. We're now at a little bit after the break for the committee discussion. I'd like to open this up for all the people around this table, the National Advisory Committee people and the presenters, for questions and comments.

Yes, Dane. You had a question right before the break.

MR. DANE BERNARD: Thank you. Dane Bernard. Yes, I did have a question and a comment. The comment, first. We've used in presentations so far the word, "risk" rather liberally. And in my humble opinion, maybe not in the appropriate context. I know it's tempting to talk about risk in context of probability of contamination when we actually mean the probability of contamination. So, I would caution as we go forward with the project, with the risk assessment, when we show slides that already categorize things by risk, it would tend to give the impression that a decision has already been made. And my impression is that's supposed to be one of the outputs of the risk assessment. And unless I've missed a whole bunch of history, we're not to the output stage yet.

So, I would caution that as we go forward, we consider the impact of those kind of statements and how we, in fact, are using the word, "risk."

The question: In neither the first two presentations did I see reference to the impact of food preparation steps on the actual amount of Listeria monocytogenes ingested. There were several of the foods

listed -- for example, hot dogs -- that, while they are sold and legally defined as a ready-to-eat product in the package, they are customarily further prepared before consumption. We all know that there are occasions when that may not happen. But certainly, if one is to calculate a good estimate of exposure, I think you have to consider how the products are going to be prepared before consumption. So, we had a list of products where we're collecting data on incidents in the marketplace and then how much of that particular product is consumed.

But I think in order to get a good estimate on how much Listeria monocytogenes is consumed, you're going to have to consider the impact of further preparation on the actual population. Thank you.

MR. MORRIS POTTER: I wonder, Dane, if that doesn't go back to something that Bob brought up in terms of modelling the survival and growth of Listeria. Given the presence, perhaps, at some point in the chain, given the amount that are then given -- how it's prepared, how it's used and how often it's consumed and by whom, then would all come together in characterization.

MR. DANE BERNARD: I think it does. I think you're exactly right, that if there is a place within the risk assessment for considering that kind of information,

that's exactly where it should be considered.

Now, as you know, we're conducting our own study that's very similar to some of this. And I think I would agree a bit with Tony's comment earlier that considering the dynamics of the marketplace, many of these things will sort of null out. But you do need to think about what the population or what the quantity of L.M. would be at time of consumption and what factors, including either growth or decline in a product, might affect that.

MR. MICHAEL JAHNCKE: Bob?

MR. ROBERT BUCHANAN: Bob Buchanan, FDA. My comments were gonna sort of echo some of yours, Dane. What I wasn't sure in the data base -- and Tony or Dick, maybe you can give me a hint -- are you going to be determining or attempting to estimate at what point in a product's shelf life the sample was actually taken or in some way differentiate in your data base whether the sample was taken at the time of manufacture, versus it was sampled in a retail market, versus it was sampled in someone's refrigerator? And, certainly, that could have a very large impact. I know it's an extremely difficult problem, particular when you're dealing with what appear to be about 10,000 different kinds of foods that you are

considering. But any plans on what to do with this? Regretfully, much of the data is collected at the point of manufacture and doesn't take into account that whole distribution potential for temperature abuse, the effect of preparation practices, et cetera.

MR. MICHAEL JAHNCKE: Please identify yourself, please.

DR. TONY HITCHINS: Tony Hitchins, FDA. Well, it's a complex problem, allowing for the differential between analysis time and how the actual food might be treated by a given consumer.

I think as Bob was already trying to tell us when he questioned me earlier, one can take into account data from survival studies, impact inoculation studies. One can do that. I guess the way I would do it is: I would say what is the frequency of contamination of franks? What is the total of franks consumed? Therefore, what is the total of mono consumed? And then I would apply corrections to that based on some feeling for survival curves. I mean, you know, it puts a lot of wobble in the final answer. But that's what risk analysis is about, I think, that one has to say, "This is what we would consume if so-and-so applies. And it will be less if it doesn't apply." That kind of thing, I

think.

I don't know if that helps.

DR. RICHARD WHITING: Richard Whiting, FDA. Following that, would you say your data bases that you're working with, Tony, generally identify where the sample is taken? So, I mean, you could take a series of a luncheon meat, for example, and you might have a certain data set was at manufacture, and then another data set was taken in the deli. And that would become part of the way you would work up.

DR. TONY HITCHINS: Thank you, Dick. I should have said that we can certainly classify our different pieces of data into whether it was taken from someone's fridge or whether it came out of retail or whatever, from the factory or whatever. We can do that to a large degree. And that may help us, too.

MR. MICHAEL JAHNCKE: Bruce?

MR. BRUCE TOMPKIN: Bruce Tompkin. This question about where the products are sampled, I assume that FDA/USDA samples are from point of manufacture. Certainly, USDA basically are. I'm less familiar with FDA. One of the outcomes of the risk assessment eventually will be to address the question of which foods are at higher risk, at least in terms of consumer, from a

consumer perspective. So, whether growth can or cannot occur in a product is important, as is another important aspect in this thing.

There is often confusion whether it's with CDC or here in this study as to what foods are. I mean, what is a fermented sausage? What does "cured" mean? As the consumers are polled by telephone and the questions are asked, do they really know what Lebanon bologna is, for example? As you go down through the various categories of foods and their recall, all this has impact on that outcome.

As you consider your different food categories, I think you can get help in terms of identifying these foods, whether they be cheeses, which you already have a pretty good fix on, or on the meat and poultry products. There's a number of us who could help you with a better understanding of what the different classes of meat and poultry products are. We can give you references; we can sit down and talk with you -- however best that could be done. I'm sure that a number of us would be very willing to help you get that clarification.

And then when it comes to the data, would it be helpful to then at least group the products for which you're painting data into perhaps three groupings -- One,

those where growth can occur; those where growth cannot occur; and those where you're uncertain.

In terms of growth, products in which growth can occur, some of us have data on that. There are published data such as what Mike did at Wisconsin. So, that we could help you with. And that also would have some impact on your interpretation of the significance of the results.

MR. MICHAEL JAHNCKE: Bob?

MR. ROBERT BUCHANAN: Bob Buchanan, FDA. Bruce, I like that idea. And certainly, FDA won't be bashful about contacting you. I wonder if it would also be good to include in that subdivision of food products what was the type of consumer preparation. And we can get that into the mix also, because certainly that's going to have a very large impact.

MR. MICHAEL JAHNCKE: Yes, Cathy?

MS. CATHY DONNELLY: Cathy Donnelly. Both Mike Doyle and Bob Buchanan asked about methodology. And I think it's really going to be important to take the data on presence, whether it's qualitative or quantitative, to focus in on the methods used to arrive at an estimate of degree of contamination because increasingly, as we look at injured Listeria, both regulatory methods in use now

do significantly underestimate Listeria better injured.

For instance -- and I'd be happy to furnish some of these data because I think they will be helpful to the risk assessment. But products like salsa, for instance, if you use a method that considers recovery of injured organisms, you go from 3 out of 30 samples being contaminated to about 23 out of 30. And so, I think that it gets to Bruce's point of data from point of manufacture, using highly-selective methods is really underestimating what's there. And that's why I think inclusion of data that had been stored under refrigeration conditions, for instance, gets that injury issue backwards kind of way and I think would be very instructive.

MR. MICHAEL JAHNCKE: Bruce?

MR. BRUCE TOMPKIN: Bruce Tompkin. So, Dane, you mentioned something about a study of some sort. And I'm not quite clear what that meant. And maybe I misinterpreted it. But is anyone actually going to undertake a market basket survey to determine what is available at retail? I note there's some issues associated with that kind of a study. But is this being pursued in any manner? And will it be quantitative?

MR. MICHAEL JAHNCKE: Richard?

DR. RICHARD WHITING: Richard Whiting. Well, FSIS has an ongoing survey of meat products, although at this point maybe somebody can clarify it. I think it is basically a presence/absence study. I don't think within FDA right now we have any ongoing survey-type for foods with Listeria. Our field office does do samples as part of the regulatory role. And we have data which we have been collecting from our field offices on the presence of Listeria that they find in certain foods. But we also realize that that is somewhat biased data and that samples are collected when the inspector often sees a need to take the sample. And I think, again -- and somebody can correct me if I'm wrong. I think this is basically presence/absence data that we collect.

So, I think there is a great shortage of ongoing data collection right now in this country as to just what the quantitative levels of Listeria are in our foods. Unfortunately, we've done some thinking within the house of what this takes. And when you have a situation like Listeria where we're often talking about 1, 2 or 3 percent of the samples being positive, and then you say of those 1 percent that's positive, how many do we need to then quantify so we have reasonable idea of what the average and distribution of positive samples

are? Our statistician came back and said we need to take something like 2,000 samples for each particular food in order to come up with good data.

And so, you start talking about 2,000 samples for everything. And then, you know, to be reasonable, now we've got to start lumping food categories together. And do we put in all raw meats and pool that or what? And it becomes a very daunting analytical problem to come up with this data.

MR. MICHAEL JAHNCKE: Yes, Bruce?

MR. BRUCE TOMPKIN: Bruce Tompkin. Perhaps this is where data from the UK and Germany -- I think those two countries in particular would be helpful because they sample at retail. And I don't know how you're able to -- what your connections are. I'm sure if you can't get it, nobody could. But those two countries do sample at retail. And it's primarily by the regional health districts that are doing the sampling. And it's just a matter of collecting that information. And at least in Germany, I believe, they also quantitate. So, that information would be a good source for not only presence/absence but the numbers associated with foods that are available for purchase.

MR. MICHAEL JAHNCKE: Other questions,

comments?

DR. TONY HITCHINS: Tony Hitchins, FDA. Yeah. I'd like to address Bruce's points. We do have data from the literature from the UK Public Health Laboratory survey and the Yorkshire survey. And we have data from Germany from the Toyful (phonetic) and Benzulla (phonetic) survey. I mean, your statement seems to imply, though, that there's a lot more data than that, even, that is current.

MR. BRUCE TOMPKIN: The published information is summaries of that kind of information. But I believe they're ongoing as part of the responsibility for the regional health authorities. So, it's just a matter of what's available and ongoing.

DR. TONY HITCHINS: Yeah. I'll just have to write to Dr. McLaughlin and so on in the UK and try and ask them.

MR. MICHAEL JAHNCKE: Yes?

DR. WESLEY LONG: This is Wes Long with FDA. I have a further point to make on that. I think we need to -- I think those are good sources of data, but I think we need to be careful because they may be under a different regulatory construct, and the measures that they have in place, be they regulatory, HACCP, whatever, may result in

different levels of those contaminations of those foods in those countries. So, we have to take that into account when we consider their data.

MR. MICHAEL JAHNCKE: Other comments, questions? Yes, Michael.

MR. MICHAEL DOYLE: Mike Doyle. Last week at a meeting in Georgetown addressing Listeria, a point was raised about missed opportunities. And we ought to be thinking about in the future when there are recalls, to see if we can relate those data as to the number of Listeria that are present and pounds of that type of food that was consumed. And that would fit very nicely into the risk assessments.

MR. MICHAEL JAHNCKE: Yes, Bob?

MR. ROBERT BUCHANAN: I do want to sort of take off my Advisory Committee hat and put on my FDA hat for a second and remind everyone that this information, there's sort of a bright, shiny line drawn in the sand about when data will be available. And while future work is pertinent in terms of validating whatever the current team is putting together or to be data for future risk assessments, at some point we have to take whatever we have and do the risk assessments. And that date is July 6th.

So, as we talk about future programs, please understand that they're not really directly pertinent to the questions at hand before the working group.

MR. MICHAEL JAHNCKE: Thank you, Bob. Other comments, questions? Yes, Tony?

DR. TONY HITCHINS: I agree with Bob, of course, that -- in keeping my thoughts. But, no, seriously, you know, we do have to go with what we've got. And, really, we can go a long way with presence and absence data. That can be converted into means and distributions if one makes certain assumptions. So that for the time being, we can get by without further collection of data that is more enumerated directly.

MR. MICHAEL JAHNCKE: Yes, Wes?

DR. WESLEY LONG: Wes Long, FDA. I want to go back to something that Dane Bernard raised earlier before we opened things up for additional comment. I would hate for the sound bite from this morning to be that certain soft cheeses are at highest risk. And I just want to clarify that what Dr. Bender was referring to was this probability of contamination and that it was important for her to categorize these different cheeses differently because when she has to match that up with Dr. Hitchins' data that's not as specific, we've got to figure out

where do we put his data, into which categories do we put his data.

So, she was just referring to a probability of contamination and not referring to the high-risk, medium-risk, low-risk cheeses. Certainly, that may be a final output of this process. But we are not at that stage now. We're not ready to make any statement to that effect.

MR. MICHAEL JAHNCKE: Dane?

MR. DANE BERNARD: Thank you. Dane Bernard. Thanks, Wes, for that clarification. Before I forget it -- because at my age, I do forget things -- Tony, I went through your references on the seafood list. And there were some additional references that both John Glenburg (phonetic) and I were made available to us at the NFAO consultation last week. And I think you might find quite interesting some very recent studies from the Nordic countries, some populations of L.M. in seafood products. So, before I forget to mention that, we'll get that to you.

DR. TONY HITCHINS: Thank you, Dane.

MR. MICHAEL JAHNCKE: Michael Jahncke. Along the same lines, I know that Mel Eklund has additional information also that if he does not remember to come up

to you, please keep that in mind.

DR. TONY HITCHINS: He alerted me to that. Thank you very much.

MR. MICHAEL JAHNCKE: Yes, Richard?

DR. RICHARD WHITING: Richard Whiting. Yeah. On that line, the purpose of the document that we've given out today is exactly for that reason. You will notice about half of it is just lists of references. It is rather straightforward, dry reading. But the purpose of it is to put it out there and show people what we are looking at. And if you are knowledgeable in an area, skim through those references. And if you see something there that we have not listed, bring that to our attention. That's one of the purposes of this document.

MR. MICHAEL JAHNCKE: Other comments and questions from the committee members? Yes, Bruce?

MR. BRUCE TOMPKIN: Are we allowed to talk about the documents at this point, too?

MR. MICHAEL JAHNCKE: If you can keep it focused on the presentations this morning, it will tie in nicely. Because there will be a chance this afternoon also to go over the -- as all the presenters will be addressing this, too.

MR. BRUCE TOMPKIN: What I would discuss would

be off, not what we've just heard. Something else.

MR. MICHAEL JAHNCKE: Yes, any other questions and comments from the group?

Yes, Bob?

MR. ROBERT BUCHANAN: Yeah, I would like to make a point and get some additional clarification from Tony on one comment he made earlier this morning.

The traditional taxonomy of Listeria monocytogenes really divides Listeria monocytogenes/innocua into pathogenic and nonpathogenic isolates based in hemolysin production.

Tony, you indicated that there are monocytogenes species that are not virulent. On what evidence did you make that designation? As far as I know, there's nothing in the literature that identifies other than genetically-manipulated strains or strains that have in some way lost a virulence characteristic due to a deletion mutation, any monocytogenes that is truly a monocytogenes that has not been considered pathogenic in an appropriate animal model.

DR. TONY HITCHINS: Tony Hitchins, FDA. Yeah, Bob. I only refer there, really, to hemolysin negative strains that do crop up occasionally when one is isolating monocytogenes from foods -- very rarely, in

fact, that kind of strain. And by inference from the deletion-type studies, one assumes that their virulence is less than the normal isolates. I didn't say there -- Well, if I implied they're totally non-virulent, only in the sense that probably a greater dose of them would be necessary to produce some kind of symptoms.

MR. ROBERT BUCHANAN: It might be helpful to the Committee members to refresh our memories on what is the distinction between innocua and monocytogenes.

DR. TONY HITCHINS: Well, it's very -- it's quite difficult, really. I mean, it's not a hundred-percent clear. But basically, you know, the taxonomists would say monocytogenes are this set of properties. And it's hemolytic, basically.

And if you've got a non-hemolytic strain, you would be in trouble in terms of normal taxonomic methods. But by other methods, you would say it's a monocytogenic.

MR. ROBERT BUCHANAN: Yeah. I guess that was my point, is that on anything except very fine genetic analysis, innocua and monocytogenes are identical except for one virulence-associated determinant. And so, it's almost by the classical taxonomy; all the pathogens wind up in monocytogenes, and all the non-pathogens wind up in innocua.

DR. TONY HITCHINS: We really don't know that all monocytogenes strains are virulent, quite frankly, do we? We just don't know that. We can isolate a lot of monocytogenes strains. But unless we give them some test -- I mean, we can argue about what the test should be. We don't know they're all virulent, really. Do we?

MR. ROBERT BUCHANAN: That was my question. Is there any evidence at all that when we've tested a monocytogenes, regardless of its serotype, as long as it has all of the appropriate virulence markers, it is pathogenic?

DR. TONY HITCHINS: Yes, but I think we'll have to wait until this afternoon until Dr. Raybourne discusses the virulence factors.

MR. ROBERT BUCHANAN: Okay.

DR. TONY HITCHINS: I don't think they've really been thoroughly defined. I mean, we know the hemolysis and that kind of thing. But there may be other factors we don't know about. We just don't know that if a hemolytic monocytogenes is isolated from a food and it doesn't correspond to any strain that had been isolated from a case of Listeriosis, exactly, exactly correspond. We just don't know it's virulent unless we then do some tests. Again, we might not agree on what those tests

should be, apart from human trials or something that comes close to human trials.

MR. MICHAEL JAHNCKE: Cathy, yes?

MS. CATHERINE DONNELLY: Cathy Donnelly. Will there be any attempts in building the risk assessment model to be proactive and contact some of the companies involved in rapid methods, whether they be typing or -- any type of DNA or life-based technology? Because to validate these methods, there's been a large amount of data collection -- Bob is sitting over there smiling -- but with the proviso that the purpose of the data isn't to engage in regulatory enforcement. I think those data bases will reveal a lot of interesting information for this analysis.

MR. MICHAEL JAHNCKE: Wes? Richard?

DR. RICHARD WHITING: Richard Whiting. Well, I was just going to say: Why don't we leave that one for this afternoon? And we'll put our two speakers who will get into more of the hazards and so on of the organism and let them deal with that.

MR. MICHAEL JAHNCKE: Other questions and comments from the group?

If not, I'll pass this over to Dr. Potter.

DR. MORRIS POTTER: At this point on the

schedule, there's time for public comment. Since this is a public meeting in addition to being a meeting of the National Advisory Committee, we would like to give non-committee participants in today's proceedings an opportunity to talk.

For those people in the audience who would like to speak, it would perhaps be most appropriate this morning to talk about those aspects of Listeriosis that relate to the presence of Listeria in foods and human consumption. But if there are folks here who would like to make comments who will not be able to stay for this afternoon and the comments are off-point, please feel free.

We understand that no one has signed up outside to make a formal presentation. But if there are comments based on what you've heard this morning or other comments, please step up to the mike and identify yourself.

I know some of you aren't this polite. All right. Good.

MR. WALLY SCHLECH: Just to get the ball rolling, Wally Schlech from Delhausen (phonetic) University. I have a long interest in Listeriosis. I listened this morning with great interest in some of the

regulatory aspects of what's being attempted to do. I think July 6th or whatever it is is a pretty short time line considering the lack of data that you have.

What I've seen expressed today is a lot of large but really anecdotal collections of data from around the country that is being pooled to determine what types of food products may be risky. And I think what I would encourage the group -- and this is obviously something you can't do before July 6th -- but that in terms of -- I think a risk assessment is a project in progress. In other words, even if you produce something July 6th, you'll still have to continue to refine it.

The idea of doing some sort of retail market sampling similar to some in the UK, I think, is critical. The numbers are large. But because of the variability and how the consumer, who basically we're trying to protect here, handles food, I think that at the retail level is the time to do some sampling. And the sampling has to be done in such a way that there can be cross-comparisons of various food products. I could be a little controversial and say if products are meant to be cooked before eating, don't bother sampling that group of products. That leaves out things like hot dogs, which obviously would be politically incorrect to leave out of

any sampling procedure.

But, theoretically, if the public's not gonna take care of itself by cooking these things properly, I'm not sure that we should spend a lot of money looking for Listeria in those products.

I'm more concerned about the deli meats and the others, salads, that are in fact meant to be consumed as they've come out of the plant in appropriate packaging. And there, I think, we do have a role in protecting them from that.

I'm sure there will be more this afternoon about the issue of virulence. My own bias would be, for example, that this E-strain phage-type that was present in this most recent problem is intrinsically different in some way than the sort of standard, run-of-the-mill serotype 4b. And the question -- We just don't know. And maybe it will come up this afternoon in discussions of virulence. But I think that that's something that needs to be critically looked at. And only science can answer those kinds of questions.

But, hopefully, it would inform the regulatory stance once that kind of data is available. I don't think -- it sounds like you're not going to go there for this meeting. Obviously, you're not planning to with the

decision about zero tolerance. And I don't think there's anything in the virulence area or in the identification of the organisms as monocytogenes that allows anyone to change the stance based on that some may be less virulent than others.

So, with those comments, I appreciate the opportunity. Thanks.

MR. MICHAEL JAHNCKE: Thank you very much, Wally. Other comments? Dane, did you have something?

MR. DANE BERNARD: Thank you. Dane Bernard from NFPA. Just a follow-up to something that Wally had said there. He mentioned sample products intended to be cooked. I don't think you're talking about a sampling program here. You're talking about what data do you consider and how do you consider it.

He also mentioned that it's probably not politically correct to do so. The Agency is going to have to weigh that. But if the purpose of the risk assessment is not to look at specific products and do a risk assessment on products, it may be appropriate to follow Dr. Schlech's advice here. Look at where your data is good, look at how you can utilize that data to make an easier projection, a more accurate projection of what is actually consumed. And maybe you don't use

products in certain categories. And maybe it is that category where, for example, with hot dogs it would be very difficult to factor in what is actually consumed -- the basis, the further preparation of those products. I mean, it's a challenge. I don't think we need to worry too much about the politics of whether to include it in the data base or not. What you need is a data base that you can work with simply and minimize your uncertainty predictions but still have a solid prediction of what is being consumed. So, I think it's not a comment that should be taken lightly. I think it should be given due consideration.

MR. MORRIS POTTER: Bob?

MR. ROBERT BUCHANAN: Bob Buchanan, FDA. Dane, I guess I have to disagree in terms of passing on advice to this group. If the primary purpose of this risk assessment is to evaluate the public health impact of Listeria, foodborne Listeriosis, and you have documented outbreaks associated with this class of products, then how are you going to get an estimate of the risk face by the consumer regardless of contributing factors without considering all products and including consideration of the likelihood that a product that will be abused, mishandled, inappropriately handled, or handled

absolutely correctly and still be associated with outbreaks?

I mean, you know, the example that was provided is one that I can confirm, based on the CDC data of the most recent outbreak and the reports I've heard of it, is that all those hot dogs that were consumed were cooked. So, we may have a representative from CDC that may want to follow that up. But I would be very cautious about eliminating products when you're attempting to get a risk assessment that's looking at the overall impact of an organism on public health.

MR. MORRIS POTTER: Thank you, Bob. Remember that today we're looking at the prevalence and extent of exposure, and then the public health impact about exposure. And for the risk assessment team, a principal take-home from today's meeting is advice on the model and help with their data collection.

Some of the comments that have been made this morning would imply that perhaps some of the classification of foods into categories needs some help. Certainly, that we need some help and data on presence, absence and numbers of Listeria in those categories of foods and perhaps information on post-purchasing handling of foods where those data exist. For those who may not

be ready for oral comments today during the meeting, remember that there is an opportunity to make written comments and to share information with the risk assessment team after this meeting up to the drop-dead date that Bob gave us.

Another comment? Could you identify yourself, please?

MS. PETRA BOYSEN: Petra Boysen from Fresh Check Services. I have a question concerning the data collection for consumption data. And I was wondering: In response to the question of regional information, has any of the sales of certain products been taken into account, assuming that the sales, that these products that are sold are being consumed?

DR. MARY BENDER: Mary Bender, FDA. No. Only probably looking at some market share. But even though I am not a nutritionist, I work with a lot of nutritionists who bristle at the idea of looking at sales data or production data as consumption because you don't know who eats what. And you might have a -- you know, it's very important data. I mean, it's critical. But as far as consumption, the philosophy at FDA is to stick with consumption data if you have it. That's another can of worms there. Thank you.

MR. MORRIS POTTER: Paul?

MR. PAUL HALL: Good morning. Paul Hall, Kraft Foods. First of all, I want to compliment this morning's speakers for their presentations and treatment of this difficult subject, to say the least. A couple questions and comments. First of all, I want to reiterate Bruce Tompkin's point. This issue of probability of contamination that we're talking about when we're doing a risk assessment. And I just want to reiterate the point that Bruce made that I think is extremely important to have some measure of the ability of these products to support growth to high levels of Listeria.

I know Dr. Bender talked about the cheese category and how difficult it is in classification of cheeses. And that's a category, of course, near and dear to our heart. And cheese is not cheese is not cheese. And we all know that you have soft cheeses where we had large outbreaks linked to Listeriosis. And then you have, say, processed cheese category in which that product, some of those products are hot-packed at a temperature that is lethal to Listeria and there's no opportunity for recontamination, versus a cold-pack type of processed cheese in which it receives no thermal treatment and there is opportunity for post-processing